PROC. ENTOMOL. SOC. WASH.
88(3), 1986, pp. 476–484

THE SAWFLY GENUS *NEMATINUS* IN NORTH AMERICA (HYMENOPTERA: TENTHREDINIDAE)

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Abstract.—Four species of the nematine genus *Nematinus* occur in North America. The genus is transcontinental in Canada to Alaska and northern United States south to California, Utah, and Colorado in the West. Known hosts are *Betula* and *Alnus*. *Nematinus* ***parsebenus,*** n. sp., is described from eastern Canada and northeastern United States, and *Pachynematus oronus* Kincaid is a new synonym of *N. pontanioides* (Marlatt). The species are keyed, described, and illustrated.

The small genus *Nematinus,* in the subfamily Nematinae, has received little attention in North America because of the lack of specimens available for study and the apparent obscureness of characters available for species separation. Ross (1951) and Smith (1979) merely listed the four described North American species and noted their type localities. Although I have seen only about 80 specimens, the number is now sufficient to define the North American species. The genus is transcontinental in Canada and northern United States extending south to Colorado, Utah, and California in the West. Known hosts are species of *Betula* and *Alnus.*

About 10 species are found in the Palearctic Region from Europe to Japan where the known hosts are *Betula, Alnus,* and *Corylus.* Benson (1958) and Muche (1977) keyed five species known from Britain and central Europe, respectively. Stein (1926) recorded some life history studies on several European species. Two groups are evident in the Palearctic Region, based on the shape of the female sheath: one with the sheath uniformly broad and truncated at the apex from above and the other with the sheath narrowing and acuminate at the apex from above. Only the latter group is found also in North America.

Females of *Nematinus* are immediately recognized by the large and expanded ninth abdominal segment (Figs. 1, 2), not known elsewhere in the Nematinae except for *Decanematus* Malaise, and the strongly sclerotized and tough ovipositor (Figs. 7–14), which is no doubt an adaptation to oviposition in stems or midveins of the host leaves (Benson, 1958). Well-defined teeth are found on the apical part of the dorsum of the lance and venter of the lancet. Males are scarce; I have seen only about five specimens, but they are more difficult to separate from males of other nematine genera and may be masquerading under other genera in collections.

Nematinus Rohwer

Nematinus Rohwer, 1911: 99. Type species: *Tenthredo abdominalis* Panzer, orig. desig. Ross, 1937: 75, 76, 82–83; Ross, 1951: 37; Smith, 1979: 56.

Description.—Antenna setaceus, 2½× head width. Clypeus circularly emarginate at center, with rounded lateral lobes; malar space broad, more than 2× diameter of front ocellus; left mandible in side view tapering evenly from base to apex, without necklike constriction between base and apical blade. Tarsal claw with small or large inner tooth. Forewing with base of vein 2A + 3A and 2r absent, 2r-m present; hindwing with anal cell present. Female with 9th abdominal segment extremely enlarged and wide ventrally; cerci about as long as sheath; ovipositor strongly sclerotized and strong; dorsal teeth on apical third of lance, that on 6th annulus largest, and 5th and 6th annuli with laterally protruding ridges; ventral teeth on apical half of lancet from 5th annulus to apex and a laterally protruding ridge on 5th annulus. Wings hyaline. Male with apical sternite slightly emarginate at apex and 8th tergite produced into a broad, rounded lobe; forewing with basal ⅔ lightly black infuscated, apex beyond stigma hyaline.

Discussion.—*Nematus* was the name applied to this group of species by Konow (1905) and others prior to Rohwer (1911). In his work on the type species of Symphyta, Rohwer (1911) fixed the type of *Nematus* as *Tenthredo septentrionalis* L. as well as the type of the genus *Croesus* as *Tenthredo septentrionalis,* thus making these two genera synonymous. *Nematus* Panzer, however, is monotypic with the type species *Tenthredo* (*Nematus*) *lucidus* Panzer, and *Nematus* and *Croesus* are currently considered separate genera. This left the group considered by Konow (1905) without a name, and Rohwer stated "For *Nematus* Konow and authors the name *Nematinus* may be used," and he designated the type as *Tenthredo abdominalis* Panzer.

The obvious recognition characters for *Nematinus* are the enlarged ninth abdominal segment, sheath, and ovipositor of the female. Disregarding these specialized structures, the relationships of members of this genus to other members of the Nematinae are difficult to determine and must wait an analysis of all the nematine genera. The evenly tapered left mandible and non-differentiated mesal and lateral flaps of the male valve exclude this group from the "specialized" Nematinae (*Pachynematus, Pristiphora, Nematus,* etc.) of Ross (1937). These characters are more similar to the more primitive genera such as *Hemichroa, Anoplonyx,* and *Fallocampus,* all of which, however, are separated by the presence of the base of vein 2A + 3A and the usual presence (except *Fallocampus*) of vein 2r in the forewing. *Nematinus* may occupy an intermediate position between the more specialized and primitive genera of the subfamily.

The enlarged ninth abdominal segment resembles that of *Decanematus,* a genus that belongs in the specialized Nematinae of Ross (1937). *Decanematus* is separated by the constriction of the left mandible separating the bulbous base and the apical blade, the sheath being two times or more longer than high in lateral view and of uniform thickness in dorsal view, the cerci which are shorter than the sheath, the lack of dorsal teeth on the lance, and the presence of serrulae the full length of the lancet (Wong, 1968).

The following key is for Nearctic females. The male is described only for *unicolor* from a specimen from New Hampshire. I have also seen males from Michigan, Minnesota, Maine, and Wisconsin, none of which differ appreciably from the description of *unicolor.* Due to possible wear of the ovipositor, the teeth of the lance and lancet of some specimens may not always appear as sharp as in the illustrations.

Key to Species

1. Inner tooth of tarsal claw small, much shorter than outer tooth and located near center of claw (Fig. 3) (small, 5.0–6.5 mm; head mostly orange, thorax with prescutum and mesosternum black, abdomen orange with terga black, except apical 2 or 3) ..... *pontanioides* (Marlatt)
– Inner tooth of tarsal claw long, nearly as long as outer tooth and usually located closer to and parallel with outer tooth (Fig. 4) 2
2. Dorsum of head, mesonotum, mesosternum and dorsum of abdomen mostly black; hindocelli farther apart than distance from hindocelli to posterior margin of head, as 1.0:0.7 ..... *parsebenus,* n. sp.
– Orange, at most black marks on lateral lobes of mesonotum and occasionally terga 1–6 or 7; distance between hindocelli subequal to distance from hindocelli to posterior margin of head, as about 1.0:1.0 3
3. Orange with black marks usually present on lateral lobes of mesonotum; area between dorsal teeth of 5th and 6th annuli of lance low and straight (Fig. 7); 5th segment of lancet nearly quadrate (Fig. 8) .... *unicolor* (Marlatt)
– Orange, basal terga sometimes blackish; area between dorsal teeth of 5th and 6th annuli of lance deep and concave (Fig. 11); 5th segment of lancet higher than long (Fig. 12) ..... *ochreatus* (Rohwer)

Nematinus ochreatus (Rohwer)

Figs. 11, 12

Pteronus ochreatus Rohwer, 1910: 198.
Nematinus ochreatus: Ross, 1951: 37; Smith, 1979: 56.

Female.—Length, 5.0–7.0 mm. Orange, narrow margins around each ocellus and dorsal margins of cervical sclerites blackish; sometimes very light stripes on lateral lobes of mesonotum and medial portion of terga 1–6 or 7 blackish. Distances between eye and hindocellus, between hindocelli, and between hindocellus and posterior margin of head as 1.0:0.8:0.8. Tarsal claw with long inner tooth. Lance with dorsal tooth of annulus 6 large, area between teeth of 5th and 6th annuli rounded, concave; 5th segment of lancet higher than broad.

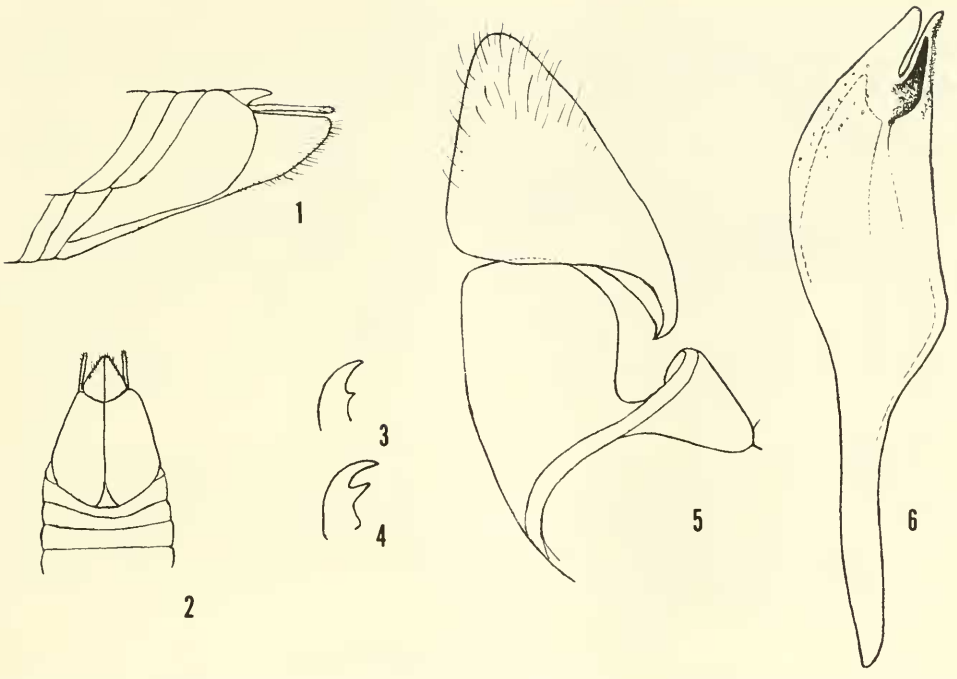
Male.—Unknown.

Type.—In USNM, female, labeled "St. John, N.B., 14 Jul.," "A. G. Leavitt, Collector," "Type No. 12022 U.S.N.M.," "Pteronus ochreatus Roh., type."

Host.—One specimen from Mabel Lake, B.C., was reared from *Alnus.*

Distribution.—British Columbia: Mabel Lake, 22-VII-50, *Alnus.* California: Echo Lake, El Dorado Co., VI-25-1954. Colorado: "Colo." New Brunswick: Edmundston, VII-19-1970; St. John, VII-14; Bathurst, VII-9. New York: Keene Valley, VI-20-1894 (labeled as a paratype of *unicolor*). Oregon: Mt. Hood; S. entrance Crater Lake N. P., VI-24-1956; Baker Co., Velvet Cr., 28 mi. SE Union, 4720′, VI-22–28-1975. Ontario: Sand Lake, VI-28-1926. Utah: Grand Co., VI-11-1963. Washington: Yakima, VI-1-1931. Wyoming: Woods Landing, Laramie R., VI-28-1948.

Discussion.—The mostly orange coloration, long inner tooth of the tarsal claw, concave area between segments 5 and 6 of the lance, and subequal distance between the hind ocelli and posterior margin of the head will separate *ochreatus.* The color is similar to that of *unicolor,* but characters of the ovipositor (compare



Figs. 1–6. 1, Lateral view of apex of abdomen and sheath of *Nematinus unicolor.* 2, Same, ventral view. 3, Tarsal claw of *N. pontanioides.* 4, Tarsal claw of *N. unicolor.* 5, Male genital capsule, ventral view of left side, of *N. unicolor.* 6, Valve of *N. unicolor,* lateral view, dorsal edge at left.

Figs. 7, 8, 11, 12) and generally smaller size of *ochreatus* (5.0–7.0 mm long compared to 6.7–8.0 mm long) will separate the two.

Nematinus parsebenus, New Species

Figs. 13, 14

Female.—Length, 5.5–7.0 mm. Antenna blackish, more brownish from 4th segment to apex. Head orange to red brown, large area on top from and including postocellar area to interantennal area and extending laterally to near inner margins of eyes black. Thorax orange to red brown with cervical sclerites, mesosternum, large spots on mesoprescutum and lateral lobes of mesonotum, and sometimes mesepisternum black. Abdomen orange to red brown with terga black except for apical 2 or 3 segments. Legs orange; coxae black at bases; all coxae, femora, and apex of hindtibia may be black. Wings hyaline, costa and stigma amber, veins brownish. Hindocelli close to posterior margin of head; distances between eye and hindocellus, between hindocelli, and between hindocelli and posterior margin of head as 1.0:1.0:0.7. Tarsal claw with long inner tooth. Lance with dorsal tooth of annulus 6 large, area between teeth of 5th and 6th annuli deeply concave. Lancet with 5th segment higher than broad.

Male.—Unknown.

Type.—Female, Cape Breton Highlands National Park, Nova Scotia, labeled "N.S.C.B.H.N.P., 60°44′W, 46°48′N, 6-VI-1983, Maple PG732858." In the Canadian National Collection, Ottawa.

Paratypes.—Maine: Katahdin, VII-8-1958 (1 ♀). New Hampshire: Bretton Woods, VII-5-1927, S. A. Shaw (1 ♀). Nova Scotia: Same data as for holotype except dates, VII-1-1983 (1 ♀), VI-22-1983 (1 ♀). Quebec: Thunder River, VI-19-1930, W. J. Brown (1 ♀); Bradore Bay, VII-25-1929, W. J. Brown (1 ♀); Indian House Lake, VII-19-1954, W. R. Richards (1 ♀). Deposited in the Canadian National Collection, Illinois Natural History Survey, and USNM.

Discussion.—This is a small species, close to *ochreatus,* but there are two consistent features that separate *parsebenus*: the hindocelli are much farther apart than their distance from the posterior margin of the head and the tooth of the sixth annulus of the lance is larger and broader (compare Figs. 11–14). In addition, this is a darker species with more black on the dorsum of the head, dorsum and venter of the thorax, and sometimes the legs; *ochreatus* is essentially all orange yellow.

Variation is noted, especially in the amount of black on the thorax and legs. The specimens from Cape Breton are darkest with most of the mesonotum, mesepisternum, mesosternum, femora, and apex of hindtibia black. Other specimens have the mesepisternum, mesoscutellum, and most of the legs orange to red brown.

The name refers to the partly black coloration of this species, a much darker species than the other North American ones.

Nematinus pontanioides (Marlatt)

Figs. 3, 9, 10

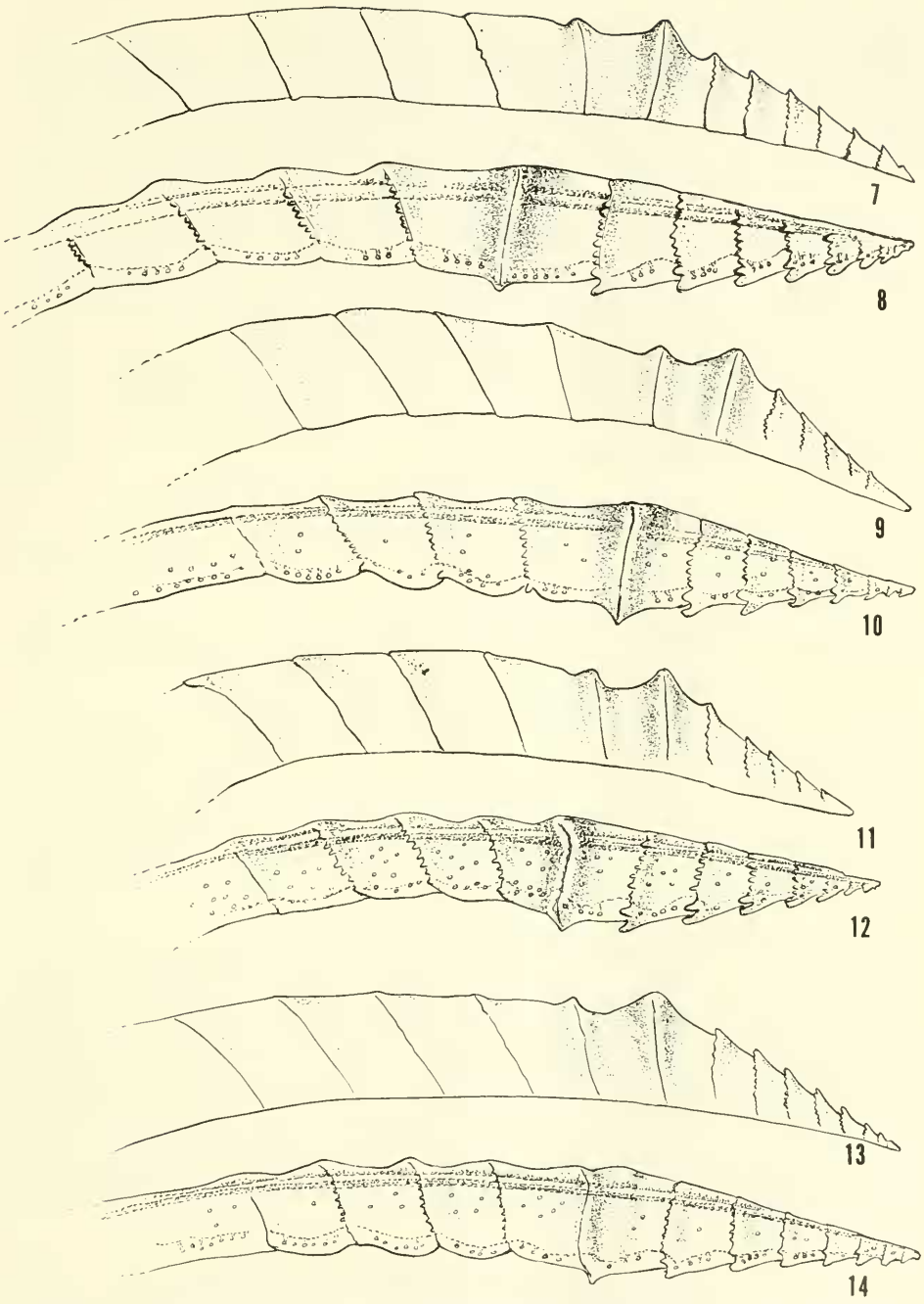
Nematus pontanioides Marlatt, 1896: 89; Konow, 1905: 63; Cresson, 1928: 8.
Nematinus pontanioides: Ross, 1951: 37 ("eastern"); Burks, 1958: 13 (Oreg., not eastern); Smith, 1979: 56.
Pachynematus oronus Kincaid, 1900: 347. New synonymy.
Nematinus oronus: Ross, 1945: 120; Ross, 1951: 37; Smith, 1979: 56.

Female.—Length, 5.0–6.5 mm. Antenna blackish, apical 3 or 4 segments reddish brown; base of scape reddish brown. Head orange to reddish brown with ocellar area and sometimes area immediately surrounding ocelli black. Thorax orange to reddish brown with cervical sclerites, usually mesoprescutum, mesosternum, mesepimeron, and metapleuron black. Abdomen orange to reddish brown with most of terga except apical 2 or 3 black. Legs orange to reddish brown with bases of coxae black; tibiae more whitish than darker orange femora and tarsi. Distances between eye and hindocellus, between hindocelli, and between hindocelli and posterior margin of head as 1.0:0.8:0.8. Tarsal claw with minute inner tooth, much shorter than outer tooth and located near center of claw. Tooth of 6th annulus of lance large, area between teeth of 5th and 6th annuli deeply concave.

Male.—Unknown.

Types.—*N. pontanioides* Marlatt, ♀, labeled "Mt. Hood, Oregon," "T. No. 10248" is in the Academy of Natural Sciences of Philadelphia (Cresson, 1928). *P. oronus* Kincaid, ♀, labeled "Yakutat Bay, Alaska, June 21, 1899," "Type No. 5285 U.S.N.M." is in the USNM; this is one of the 3 females Kincaid had, all with the same data, and is hereby designated lectotype.

Distribution.—Alaska: Same data as for lectotype of *oronus*; Curry, VI-28-1952; on tundra, Naknek, VII-3-1952, VII-8-1952; Muir Inlet, Glacier Bay, VI-26-1965. British Columbia: Emerald Lake, VI-12-1970; Forbidden Plateau, Vancouver Is.,



Figs. 7–14. Ovipositors. 7, Lance, and 8, lancet of *Nematinus unicolor*. 9, Lance, and 10, lancet, of *N. pontanioides*. 11, Lance, and 12, lancet of *N. ochreatus*. 13, Lance, and 14, lancet, of *N. parsebenus*. All are drawn to the same scale.

VII-13-1935, 6000′. Oregon: Linn Co., Monument Peak Guard Station, VII-17-1969; Monument Peak summit, 8 mi ESE Gates, 4725′, VI-16-1960; 5 mi W Suttle Lake, VII-8-1939; Mt. Hood. Washington: Bald Knob Campground, Mt. Spokane State Park, Spokane Co., 4800–5200′, VII-6-1978, sweeping; Seattle, UW campus, 1945; Stevens Co., Deer Lake nr. Chewelah, V-27-1973.

Discussion.—The small inner tooth of the tarsal claws and the black on the ocellar area, mesoprescutum, mesosternum, and terga are distinctive for this species. Two specimens, the type of *pontanioides* and the specimen from Seattle, Wash., are slightly darker with most of the thorax blackish. This species is primarily northern with southern extensions in the Cascades and northern Rockies; most of the southern specimens were taken at high altitudes.

Marlatt (1896) stated the following regarding the name he proposed: ". . . long sharply pointed sheath and long cerci may indicate a gall-making habit, whence the designation *pontanioides*." Though nothing is known of its habits, it is probably a leaf feeder rather than a gall former.

Nematinus unicolor (Dyar)

Figs. 1, 2, 4–8

Nematus unicolor Dyar, 1895a: 308; Dyar, 1895b: 340; Marlatt, 1896: 88; Konow, 1905: 63.

Nematinus unicolor: Ross, 1937: 82–83; Ross, 1951: 37; Wong, 1951: 65; Wong, 1954: 154–158; Burks, 1958: 13; Smith, 1979: 56.

Female.—Length, 6.7–8.0 mm. Orange with black streaks on lateral lobes of mesonotum; pronotum, tegula, clypeus, malar area, and tibiae paler, more whitish than orange on rest of body. Wings very faintly yellowish. Distances between eye and hindocellus, between hindocelli, and between hindocelli and posterior margin of head as 1.0:0.8:0.9. Tarsal claw with long inner tooth. Dorsal tooth of 6th annulus of lance rather small, low, area between teeth of 5th and 6th annuli shallow, nearly straight; 5th segment of lance nearly quadrate.

Male.—Length, 5.0 mm. Head orange with large black area on dorsum surrounding ocelli and extending nearly to antennal insertions and inner margins of eyes. Thorax orange with prescutum and lateral lobes of mesonotum, dorsal half of mesepimeron, mesosternum, and metanotum between cenchri and metascutellum black. Abdomen reddish brown with terga 1 and 2 black. Legs reddish brown with only extreme bases of coxae black. Forewing blackish infuscated to about stigma, hyaline apical to stigma. Hypandrium slightly emarginate at apex. Valve without differentiated mesal and lateral flaps, apex divided into 2 small membranous lobes and lateral face with sclerotized spur (Fig. 6); ventral view of genital capsule as in Fig. 5.

Type.—Female, labeled "4J," "reared from larvae on white birch, H. G. Dyar coll.," "Type No. 3492 U.S.N.M.," "Nematus unicolor Marlatt, type." Dyar's "4J" rearings are from Keene Valley, N.Y. A type was not designated and there are 5 females in the USNM labeled "4J." The one labeled as above is designated lectotype.

Distribution.—British Columbia: Summit Lake, mi 392 Alaska Hwy., VI-29–30-1959, 4500′; Barkerville, VI-29-1948, on snow 6000′. Maine: Orono, VII-16-1913. Manitoba: (Wong, 1954). Michigan: Marquette. Newfoundland: Corner Brook, VIII-1967. New Hampshire: Hanover; Mt. Washington, 5300′, VII-25-

1971; Hampton, VI-11-1919, VI-5-1908, VI-7-1906. New York: Keene Valley ("4J"); Cranbery Lake, VI-15-1925. Nova Scotia: Tabusintac, VI-II-1939; Cape Breton Highlands National Park, 60°50′W, 46°47′N, VII-1-1983, birch PG666829. Ontario: Constance Bay, white birch, III-9-1948; P. Arthur, white birch, em. III-20-1944; Steenbaugh, white birch, III-8-1951, III-1-1951. Quebec: Covey Hill, VI-28-1923; Lanoraie, VI-20-1915. Saskatchewan: (Wong, 1954). South Dakota: Harney Peak, VII-19-1924.

Host and biology.—Reared from white birch, *Betula papyrifera* Marsh. Dyar (1895a) stated that the larva sits flat on the surface of the leaf or is curled spirally; on maturing the larva enters the ground and forms a compact dark brown cocoon. He indicated the eating habits are as those of the "preceding" (species described) which he described as being solitary, on the underside of the leaf eating only the lower epidermis and parenchyma until nearly full grown, at which time they eat nearly the full leaf. Wong (1954) included the larva in a key to sawfly species feeding on white birch. He found larvae from the early part of July into September and October as solitary feeders feeding flat on the leaf and eating holes through it. They formed cocoons in the litter or topsoil for overwintering. There is one generation a year. The larva lacks caudal protuberances (present in *Nematus* and *Croesus* larvae) and the shape of the body is tadpole-like. Wong (1951) described the cocoon as being cylindrical with double walls, an outer wall of dull, loosely constructed coarse silken strands with earth and sand incorporated and adhering to it, and an inner wall that is shining and leather-like.

Discussion.—On the average, this is the largest species of *Nematinus* in North America (compare lengths of other species). The nearly entirely orange coloration, long inner tooth of the tarsal claws, and nearly flat area between the dorsal teeth of the 5th and 6th annuli of the lance are characteristic.

Ross (1937) described the male, associated with *unicolor* by females taken at the same locality (Hampton, N.H.). I regard this as the male though I have not seen specimens associated by rearings. All reared specimens I have seen are females.

Though attributed to Marlatt in the literature prior to 1979, Dyar's (1895a, b) description of the larva precedes Marlatt's (1896) description. Marlatt described the female from the series reared by Dyar ("Green Valley" in Marlatt must be an error for "Keene Valley") and also included one female from Mt. Hood, Oreg. The female from Mt. Hood is *N. ochreatus*. Though it was not described by Dyar, I regard the adult as lectotype. I could not find larvae and the adults are essentially part of the type series even though a different life stage. Dyar (1895a) did not intend to take credit for the species, indicating "Marlatt MS"; it was his intent to describe only the larva even though he must have had reared adults at hand.

Acknowledgments

I thank the following for loaning specimens on which this study is based: H. Goulet, Biosystematics Research Institute, Agriculture Canada, Ottawa; D. W. Webb, Illinois Natural History Survey, Champaign; D. S. Chandler, University of New Hampshire, Durham; W. W. Middlekauff, University of California, Berkeley; D. Azuma, The Academy of Natural Sciences, Philadelphia, Pa.; J. D. Lattin, Oregon State University, Corvallis; R. Zack, Washington State University, Pullman. Other specimens are in the National Museum of Natural History, Wash-

ington, D.C. (USNM). I express thanks to H. R. Wong, Canadian Forestry Service, Northern Forest Research Centre, Edmonton, Alberta, H. Goulet, Biosystematics Research Institute, Agriculture Canada, Ottawa, and D. A. Nickle and E. E. Grissell, Systematic Entomology Laboratory, USDA, Washington, D.C., for review of this manuscript.

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